STRONG ACID AND BASE CALCULATIONS

For strong acids and bases the following formula is used in calculations:

$$K_w = [H^+_{(aq)}][OH^-_{(aq)}]$$

Where $K_w = 1.0 \times 10^{-14}$ $\frac{mol^2}{L^2}$

Ex:
Find the $[H^+(aq)]$ and $[OH^-(aq)]$ in 500ml of a solution containing 2.6g of barium hydroxide.

Step 1: Write the dissociation equation:

Step 2: Find the moles of acid or base (in this case barium hydroxide)

Step 3: Find the concentration
Remember: $C = \frac{n}{V}$

Step 4: Find pH or POH if the question requires it. Remember pH + POH = 14

Concentration units: mol/L

$K_w = 1.0 \times 10^{-14}$ mol/L

$C = \frac{n}{V}$ $\quad n = \frac{m}{M}$

$[H^+][OH^-] = K_w$ $\quad -14$

$0.060 = 1.0 \times 10^{-14}$ mol/L

4 to 13

$K_w = [OH^-][H^+]$

13. 0 — 7 — 14

$NaOH = 26g$ $\quad pH = 14.6$

$Vol = 150mL$ $\quad pH = 14.6$

26g → $C = \frac{n}{V}$

pH

pOH

$[OH^-] \rightarrow 1.0 \times 10^{-14}$

pOH → pH

pH → pOH

Ex: V = 500 mL = 0.500 L
m = 2.6 g $Ba(OH)_2$
$[H^+]$ = ? $[OH^-]$ = ?

① $Ba(OH)_2(aq) \rightarrow Ba^{2+}(aq) + 2OH^-(aq)$
0.0300 mol/L 0.0600 mol/L

② $n = \frac{2.6\,g}{171.35\,g/mol} = 1.5 \times 10^{-2}\ mol$

③ $C = \frac{n}{V} = \frac{1.5 \times 10^{-2}\ mol}{0.500\ L}$

$C = 0.0300\ mol/L$

$[OH^-(aq)] = 0.0600\ mol/L$

* $[H^+(aq)] = \frac{1.0 \times 10^{-14}\ mol^2/L^2}{0.0600\ mol/L}$

$= 1.67 \times 10^{-13}\ mol/L$

④ If there were a Step 4

*pH = 12.78

pOH = 1.22